

ANNEX 11

External science review of CABI's Swiss centre and operations at Delémont

March 10-12 2015

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Introduction:

Two of the reviewers of CABI's External Science Review (Christian Borgemeister and Geoffrey Hawtin) visited the CABI Centre at Delémont, Switzerland, from 10-12 March 2015, to review the work at the Centre. In addition to the overall terms of reference of the science review, the team visiting Delémont was requested to address certain specific issues (see Annex 1). The schedule of people met during the visit is given in Annex 2.

1. Background to CABI Switzerland operation and recent history of the Delémont station

The history of CABI's Swiss operations date back to the late 1940s. At that time the CABI Executive Council decided that a Central Europe station was needed. The initiative was particularly supported by Canada since they wanted the organization to start exploring for natural enemies of alien invasive (AI) forest pests in North America. In 1958 the station was moved from Zurich to its present location in Delémont. In 1963, CABI purchased some land to construct a building, and landholders in and around the town of Delémont permitted CABI to lease some of the surrounding agricultural land. With permission from CABI's HQ, the building was extended by 50% in 1997. It contains a number of entomological laboratories, and a basic chemistry lab. In addition, in the basement of the building CABI operates an internationally accredited quarantine facility that enables the Centre to introduce and maintain exotic biological control (BC) agents. Since 2010, a number of renovations have been made to improve operations at the Centre, including additional offices and rearing laboratories.

The entomological laboratories are rather basic in terms of their equipment but are very well suited for the field-type research that CABI scientists and students are primarily carrying out in Delémont. To the extent that facilities are required for more advanced scientific work, such as in molecular and biotechnology studies, the work is effectively outsourced to other institutions that collaborate on the projects. All scientists interviewed seemed happy with this arrangement and nobody indicated any need for CABI to develop its own advanced laboratory facilities at Delémont.

In addition to the labs, the Centre in Delémont has several rearing rooms for plants and insects, a number of offices, meeting rooms, a modern video conferencing facility, a library and kitchen. Adjacent to the main building are three more sophisticated, and two rather basic greenhouses as well as space to run trials with potted plants.

Up to approximately 10-15 years ago CABI's operations out of the Delémont Centre were primarily focused on classical BC of AI forest pests and AI weeds in North America. Only during the last few years have both the research portfolio and to a lesser extent the geographic focus, broadened. Yet even today, R&D activities in the northern hemisphere predominate. Despite this, CABI Switzerland has, and continues to contribute significantly to the overall science output of CABI, as

demonstrated by its significant share of the organization's overall original publications, especially those in peer-reviewed and higher impact factor (IF) journals. Thus CABI Switzerland is no doubt a, if not the, key science provider for important research areas like BC, in addition to Egham UK.

2. Science

In all our discussions we were very impressed by the knowledge, skill and motivation/enthusiasm of CABIs scientists in Delémont. All of those we met and interviewed enjoy a solid reputation among their peers, representing a very critical asset for the organisation. Despite the limited scientific hardware, CABI scientists are producing world-class research, particularly in the wider area of BC.

Partnerships

A key requisite for the effectiveness of the operation is the well established partnership model with leading universities in Switzerland, elsewhere in Europe, North America and the close ties with the CABI-MoA joint lab in Beijing, hosted by CAAS. This enables CABI to incorporate research areas in its programmes where it does not have a comparative advantage such as chemical ecology, molecular biology, biotechnology and advanced modelling. We think that this outsourcing partnership model is very effective and appropriate, and we would not advise CABI to build up any significant in-house capacity in areas like molecular biology or biotechnology.

Students

A similarly successful model is the involvement of PhD, MSc and summer students in research projects. Not only can CABI Delémont's very good publication track record in large measure be attributed to this, but the Centre is providing essential capacity building in important fields like BC, and in this way successfully grooms scientific talent; many of the CABI scientists we talked to had started their career as summer students or PhD students in Delémont.

Publications and access to literature

As indicated earlier, the publication effort and output by CABI's Swiss Centre scientists is impressive. However, we do believe researchers should be encouraged to aim, wherever appropriate, for higher IF journals, in the sense that one PNAS paper weighs more than several with an IF <2. One of the prerequisites for this is, of course, access to scientific information. The lack of ready access to much of the scientific literature was a concern expressed by many of the staff we interviewed in Delémont – a concern that is exacerbated by the knowledge that CABI-Wallingford has access to almost the full range of relevant literature through its abstracting and publishing services. While we fully recognize the reasons for this apparent paradox, and the high cost of making scientific literature available to staff, we nevertheless recommend that CABI continue to give the matter serious attention.

Publishing in open access journals

Increasingly donors are insisting that research output has to be published in open access journals. Thus CABI scientists should target publishing in reputable high IF open access journals such as the ones from the PLoS family. We recognize that this entails a significant cost for which funds are not always available, but we would urge CABI to continue to give this attention with the aim of ensuring that lack of funds do not limit the scientists' ability to publish in open access journals. One way of assuring this would be to routinely budget publication expenditures in all project proposals to donors.

Open data

In parallel to publishing papers in open access journals, there is an additional drive to make research data publicly available; an increasing number of journals is making this a prerequisite for publication. We applaud CABI's efforts in this area, for example its membership of the Global Open Data for Agriculture and Nutrition (GODAN) initiative that supports global efforts to make agricultural and nutritionally relevant data available, accessible, and usable worldwide without restriction.

Biometrics

Another concern voiced by several staff members interviewed is the need for greater support in the area of advanced statistics and biometrics. We agree with these concerns and believe it is very important for the continued success of R&D at CABI that professional support in advanced statistics and quantitative analyses are more readily available. We thus strongly recommend that CABI consider either employing a biometrician who could serve the needs across its various Centres, or else ensure formal arrangements are in place for all CABI scientists to be able to access the expertise they need from elsewhere.

Deviating slightly from the official organogram of CABI's Swiss Centre in Delémont we felt that the science could best be categorized into 3 broad areas: a) invasives (both weed and pests), b) integrated crop management (ICM) and Plantwise, and c) ecology and ecosystems. In the following we would like to highlight and summarise some of the research in these three areas, and give some recommendations regarding future orientation.

Invasives

Socio-economics

Research on many aspects of AI weeds and pests is without doubt the greatest strength and asset of CABI's Swiss Centre. It is not limited to BC but also encompasses important areas like risk assessment, invasion ecology, and ecosystem services. While CABI is reasonably strong in most of the key scientific disciplines required, there is an obvious need to strengthen CABI's capacity in socio-economics – and in Delémont, particularly in micro and macro economics to enable robust and meaningful *ex ante* and *ex post* evaluations and impact assessment studies. While it might be possible to outsource to partners much of the economics work needed, in order to build effective links and facilitate interactions with the economics community, we believe CABI should consider recruiting an economist onto its own staff.

Policies regarding BC of Invasives

Work on invasives is generally speaking quite fragmented with many relatively small projects in terms of funding, which are costly in administrative terms. This applies in particular to BC of AI weeds. Yet at the same time this is a very important area in which CABI scientists have built up a world-class reputation over many years. Funding for weed BC comes mainly from US Federal entities (USDA, APHIS; BLM etc.) as well as US State Departments and Canadian province Ministries. Interestingly, USDA through its lab in Montpellier was in the past the main competitor of CABI in classical BC research worldwide, though because of reduced federal funding is increasingly seeking partnership with CABI in this field. BC of both AI weeds and pests is facing increasing bureaucratic obstacles in North America and Europe, often leading, especially in the case of the US, to unnecessary long delays in the decision making process. This is mainly due to rising concerns about potential adverse environmental consequences of the introduction of exotic natural enemies of AI weeds and pests.

Nagoya Protocol

Another major policy problem that CABI's BC scientists are facing is reduced access to natural enemies of AIs in their putative area of origin as a consequence of the way some countries are interpreting the Nagoya Protocol. This can be a critical threat to classical BC worldwide. Given CABI's eminence in the field, we believe that the institute is well placed to play a central role in helping solve this problem. We strongly recommend that CABI increase its advocacy efforts in appropriate international fora for the free exchange of natural enemies of AI pests and weeds, not only among CABI member countries but worldwide.

ICM and Plantwise

ICM in Asia

Historically the ICM program developed as a spin-off from CABI's BC work. It started in 2000 with the first activities in North Korea on the BC of cabbage pests and establishing *Trichogramma* mass production facilities for maize cob borer control. The programme later expanded both in terms of countries/regions as well as in scope, increasingly embracing a system/farming system approach. Presently the ICM program is part of CABI's 'Knowledge for Development' work, and ongoing ICM activities appear to have a stronger implementation than research focus (possibly with the exception of the project on IPM in rice in SE Asia). The close collaboration between the ICM team in Delémont and the joint CABI-CAAS lab in Beijing in the development of several ICM project proposals for EuropeAID could serve as a blueprint for more inter-Centre success stories.

ICM research output

Despite the fact that the plant clinics concept (that emanated from the DFID supported Global Plant Clinic project) was not developed out of Delémont, we see a clear evolutionary path from the first ICM activities to Plantwise, especially in terms of the drive to implement research results and the multi-stakeholder approach. At present the ICM group provides critical support to Plantwise in the development of appropriate policies and tools for the use of pesticides and other agro-inputs. However, the ICM activities so far have not meaningfully contributed to the Centre's publication output.

Strengthening Science in relation to Plantwise

Plantwise has recently been the subject of several external reviews – and more are planned. Furthermore, given the fact that the programme is primarily focused on implementing science rather than creating new research results, it does not feature prominently in the ToRs of this review mission. However, we would like to add a couple of comments and suggestions vis-à-vis the potential of this program to lead to new science in CABI and how Plantwise might better capitalize on CABI's research. We believe both aspects would be considerably enhanced through more detailed analysis of the findings that are emanating from the various Plantwise operations. We were informed that so far approximately 80,000 Plantwise datasheets have been uploaded into the program's knowledge databank, and CABI scientists at Egham have started to analyze them. According to initial results, based on a subset of ca. 1,000-2,000 datasheets, it appears that the technical quality of the data was somewhat lower than expected or hoped but that nevertheless the scientists expected that such analyses could help improve the overall quality of the program. We believe the success and sustainability of Plantwise will depend to a very large extent on the technical quality of the recommendations given and that this, in turn, will depend on improving the efficiency and accuracy of the ways in which the data emanating from the operations are validated and feedback provided. To achieve this it will be crucial that the data are analyzed rapidly, which implies the need for

automating the validation process. The best way to achieve this might be a) for the data to be made available in a digital format including, crucially, digital images and b) for the analysis of the data and images to be automated to the extent possible, e.g. through the use of image recognition and identification systems. An important move in this direction might be to up-scale the present Kenyan pilot initiative that aims to provide Plantwise staff with tablet computers for recording and uploading data and images. While we believe that the long-term success of Plantwise will be greatly enhanced by giving attention to these two issues, this does not necessarily imply that CABI itself should embark on its own research to develop appropriate image recognition and identification systems. It could, instead, seek to work through strategic partnerships and collaborations with other players, e.g. Google.

Ecology and ecosystems

Expanding the work

The different activities that we have considered under this heading are not necessarily under one program or theme in CABI in general or the Delémont centre in particular, but seem to us to be crucial for the organisation as a whole and represent an area where CABI has a specific comparative advantage. Scientists working in the broad area of ecology and ecosystems contribute considerably to CABI's recognition and standing in the scientific community, specifically with their high IF publications. In the past the group's activities have primarily been funded through relatively small grants from science donors such as the Swiss National Science Foundation (SNF) and the EU. However, lately they have been actively involved in the development and conceptualisation of the new, large SNF/SDC supported project on 'invasive woody species in East Africa'. We believe that this is a very positive development and will open up new opportunities for collaboration with CABI's Centre in Nairobi (and possibly beyond). So far the ecology and ecosystem group's activities have largely been restricted to Europe, but this 'exposure' to developing countries environments will no doubt considerably broaden the horizon of the scientists involved and open up new funding opportunities. It represents another important area where CABI can make a positive impact on the lives and wellbeing of rural populations in developing countries and it receives our full endorsement. Moreover, we think that introducing some of the skill sets of the group, for instance in terms of ecological theory and methods, advanced statistics, modelling etc., to the CABI group in Nairobi will add some 'scientific spice' to the current primarily development-focused activities in Africa.

3. Future areas and inter-Centre collaboration

Comparative advantage in BC of AI species

We strongly believe that the CABI Centre in Switzerland should continue its excellent work on BC, especially that on AI weeds and pests. CABI is well recognised in this area, and except for the USDA lab in Montpellier and some US and European universities that are recently getting more involved in classical BC, there is no significant competitor in the international arena. CABI thus has a clear competitive edge and one on which it should continue to capitalise.

Broadening the geographic focus

We also strongly endorse recent moves to broaden the geographic focus of the work through, for example, expanding the involvement of Swiss-based CABI scientists in activities in Africa. We see this as very encouraging and consider that the two large SNF/SDC funded projects that have started recently in West and East Africa respectively could become 'game changers' for the institute. The 'insects for feed'

project adds to CABI's portfolio a new and promising – although possibly overcrowded - field of research and, for a variety of reasons, we believe that the project on 'invasive woody species in East Africa' could become very influential within CABI overall. During our discussions in Delémont, nearly all the scientists we interviewed made some reference to the 'Big Push'. In spite of a seeming lack of clarity as to exactly what 'the Big Push' actually is, we would endorse any effort to significantly raise awareness and focus activities on AI weeds and pests, and the potential for BC to mitigate their impact; clear areas of comparative advantage for CABI. As we see it, the project on 'invasive woody species in East Africa' could become a ground-breaking activity for the larger 'Big Push' initiative. This could result in multiple benefits, among them a stronger science agenda at CABI Nairobi in a very important but generally neglected area (i.e. weed BC) as well as stronger linkages between scientists in CABI-Switzerland and their colleagues in Africa and hopefully other CABI Centres as well.

4. Funding, structural and organizational issues

Fragmentation

There appears to be quite a high degree of fragmentation of the work at CABI-Switzerland, in large part because of the considerable number of small projects, particularly in the invasives research programmes. We believe that Centre management should continue to explore ways to increase overall coherence and reduce administrative costs, at least in part through seeking larger, consolidated projects.

Cost of Delémont Centre

Operating a Centre in Switzerland is obviously relatively expensive and the question has been raised as to whether or not this is the most cost-effective European location for CABI's work. Should the Centre move to an ecologically similar environment, e.g. in Slovenia or Hungary? While in the long term this might result in lower costs, we believe that these are likely to be outweighed by the detrimental effects of breaking the very close and longstanding relationships that have been built up between the CABI Delémont scientists and important Swiss donor organisations such as SDC, SNF and the Canton Jura, as well as with partners in the academic and scientific communities. Clearly an in-depth cost-benefit analysis would be needed before any such move could be contemplated.

Monitoring and Evaluation

We believe that the work out of Delémont, and possibly the organisation as a whole, would benefit from a more comprehensive and effective M&E system. While it appears that CABI makes wide use of logframes and many/most projects have established milestones and goals with verifiable indicators, we believe the overall M&E system could still be improved, with lessons learned being fed back into improving the design and execution of new projects. As we understand it, Plantwise has recently adopted an effective M&E system and we would recommend that CABI consider this as a possible model in seeking to strengthen monitoring and evaluation across the entire scientific work of the institute.

Social Science

While, as pointed out above, we consider the primary need in Delémont in the social science area is for strengthening expertise in micro and macro economics, work at the Centre would also clearly benefit from the input of social scientists working in disciplines such as sociology, anthropology and gender. Given availability of resources we would not recommend building up staff strength in these areas in

Delémont, but consider that it would be more relevant for CABI to strengthen this capacity in developing regions, in house or through partnerships. Nevertheless as CABI continues to integrate its activities across the whole institute ('One CABI'), we would hope that scientists located in Delémont could draw upon the expertise and contacts developed elsewhere.

Commodities, biopesticides and molecular work

Although we touched upon CABI's work on commodities only scantily in our discussions in Delémont, it was clear that there are currently no projects that focus on specific commodities (coffee, cacao, tea, sugar, cotton, oil palm rubber, etc.). The same seems to be true for the work on biopesticide development, although the scientists in Delémont indicated strong support for the evaluation of biopesticides and downstream research on their use – especially in relation to the work on ICM, IPM and Plantwise. In the area of molecular work, there was strong support for CABI's work on fungal identification but CABI's comparative advantage in molecular research/biotechnology was less clear. These are issues that will be taken up by the Review team in their assessment of CABI science as a whole.

Private Sector

Despite some significant efforts by the CABI staff in Switzerland, partnerships with the private sector remain sketchy and relatively unimportant (except may be for the long-term partnership with Philip Morris). The majority of the research outputs from CABI Delémont are of a global public goods nature and consequently of limited interest to the private sector. There was little awareness of the European Biocontrol Business Initiative among the people we spoke to in Delémont. Unless the focus were to switch from classical BC to research that is more conducive to private investment we do not see significant opportunities for PPP. Overall we foresee more important funding opportunities opening up with the strengthening of the work in developing countries – and in particular in Africa. However, we recognise that the broader review of CABI science may reach a different conclusion and be able to identify business opportunities that we were unable to see during our visit to Delémont.

Board of Trustees

Concerns were expressed by several scientists in Delémont over what was seen as a shift in CABI towards a greater emphasis on development and knowledge management, away from scientific research. While recognizing that this might expand CABI's ability to generate additional financial resources, we believe that this can best – if not only - be done from a sound scientific base. CABI needs to conduct good science to be successful in implementation and *vice versa*. We believe that the overall Science Review team should give attention to ways of strengthening the position of science within CABI and its oversight by both the Board and senior management.

5. Conclusions and summary of recommendations

We were impressed with the overall focus and quality of the science being conducted at Delémont. We strongly believe that the CABI Centre in Switzerland should continue its excellent work on biological control, especially that on alien invasive weeds and pests. CABI is well recognised in this area, and there is no significant competitor in the international arena.

All of the scientists we met were enthusiastic about their work and the Centre as a whole has an impressive scientific output – accounting for a large percentage of

CABI's output of research publications, especially of those in higher impact factor journals. The facilities are basic but adequate, especially given the Centre's ability to access top class laboratories and expertise elsewhere within Switzerland and beyond, through various partnership arrangements. We commend CABI for its use of PhD, MSc and summer students and note their important contribution to the research and publications output.

We were particularly impressed with the potential of the new SNF/SDC supported project on 'invasive woody species in East Africa'. We believe that this is a very positive development that will open up new opportunities for collaboration with other CABI Centres and, if successful, new funding opportunities for the Delémont Centre. We see this as an important initiative in the context of both the 'Big Push' as well as the integration of the whole of CABI's work through the 'One CABI' initiative.

While we were unable to identify significant opportunities for strengthening links with the private sector arising from the current programme of work in Delémont, we regard CABI's comparative advantage as lying primarily in the global public goods arena and see significant opportunities for CABI to attract additional resources for its work in developing countries, especially in Africa.

We raise issues relating to Commodities, biopesticides and molecular work as well as the management and oversight of CABI's science as a whole, and commend them for the consideration of the full review team.

Key recommendations arising from the review visit include:

1. We encourage CABI management to continue to seek ways of improving the access of research staff to scientific literature.
2. Further attention should be given to finding ways to help support the publication of CABI research papers in open access journals, e.g. through including an item on publications in the budgets of all proposals submitted to donors.
3. We recommend that CABI consider either employing a biometrician to serve the needs of scientists across the institute, or else ensure formal arrangements are in place for all CABI scientists to be able to access biometrical expertise externally.
4. There is a need to strengthen capacity for micro- and macro-economics work, especially in *ex ante* and *ex post* evaluation and impact assessment. While it might be possible to outsource at least some of this work, it would be preferable, if resources allow, to recruit an economist to be stationed in Delémont.
5. In the context of the Nagoya Protocol, we recommend that CABI increase its efforts to advocate, in appropriate international fora, the free exchange of natural enemies of AI pests and weeds, not only among CABI member countries but worldwide.
6. In order to improve the validation of diagnostic data collected through Plantwise, and hence the advice provided to farmers by the Plant Clinics, we recommend that consideration be given to developing image recognition systems for identifying and validating symptoms and causal agents from digital images taken by plant doctors.
7. Given the large number of relatively small projects managed out of Delémont, we encourage Centre management to continue to explore ways to increase overall coherence and reduce administrative costs through seeking funding for larger, more consolidated projects.
8. We believe that the work at Delémont, and possibly the organisation as a whole, would benefit from a more comprehensive and effective monitoring and evaluation system and we thus strongly endorse management's efforts to strengthen M&E.

9. Many projects would benefit from the input of social scientists working in disciplines such sociology, anthropology and gender. While we do not recommend building up staff strength in these areas in Delémont, we do believe CABI should consider strengthening this capacity in one or more developing regions (in house or through partnerships), in such a way that scientists at Delémont can tap into the expertise as required.

Annex 1. Overall Terms of Reference for the External Review of CABI's Science

Retrospective: has CABI's science programme since the last review (2009) been fit for purpose? Have we delivered to stakeholder requirements and CABI strategic plans? Aspects to consider might include:

- Response to and implementation of recommendations from the prior review
- Publications and their impact
- Quality of science/resources/people in key areas
- Scientific aspects of project design, delivery and outputs
- Monitoring and evaluation of project outcomes and delivery
- Project relevance/responsiveness to member country priorities
- Project impacts
- Partnership management and development (how do our national and international partners feel about working with CABI).

The Future:

- what should the focus areas be, building on current areas of actual (or perceived) strength?
- Based on the identified key areas to build on for the future, how do we optimise our science programme towards achieving CABI's mission and goals?
- Should we continue to focus our research efforts in E-UK and E-CH or should we broaden / replace them with activities in selected / all developing country Regional Centres?
- What additional technologies, facilities and skillsets should we consider in order to pursue the recommended focus areas?
- Who would be good strategic partners with whom we could pursue the recommended areas?
- How should we monitor and evaluate our science going forwards?

Specific issues to be considered in the Review of CABI's Science programme based at Delémont, Switzerland

Review with the objective to focus activities and optimise skills across both European sites (UK and Switzerland):

- Skills, gaps and overlaps for harmonisation and coordination
- Functional organisation (including leadership) of research programmes to facilitate potential reorganisation and subsequent science-based business development
- Achievements or otherwise of the European Biocontrol Business Initiative
- Current business/funding sources as a basis for identifying opportunities for potential new science-based business in Europe/UK
- Identify mechanisms (including financial aspects) for using European expertise to support younger CABI operations, including in the field of development cooperation
- Identify the opportunities/needs for molecular studies and identification tools to address the questions - Do we need to add to molecular skills/technologies? If so, is this just in the UK or does it apply to other places as well/instead?

Annex 2

Schedule of the review team's visit to Delémont

10th March

Afternoon

- Introductory meeting with **Ulrich Kuhlmann**, Country Director - Switzerland, Integrated Crop Management Programme Leader and Plantwise Programme Executive (to become Director for Europe and the Americas) and **Emma Jenner**, Assistant Director
- Meeting with **Marc Kenis**, Programme Leader, Risk Analysis & Invasion Ecology

11th March

Morning

- **Harriet Hinz**, Programme Leader, Weed Biocontrol (to become Country Director - Switzerland)
- **Tim Hays**, Programme Leader, Arthropod Biocontrol
- Tour of facilities at Delémont

Afternoon

- Meeting with MAS ICM students
- Meeting with **Ulrich Kuhlmann** and **Emma Jenner**: Integrated Crop Management
- Meeting with **Dirk Babendreier** and **Keith Holmes**: Integrated Crop Management
- **Ulrich Kuhlmann** and **Wade Jenner**: Plantwise

12th March

Morning

- **Urs Schaffner**, Programme Leader, Ecosystems Management
- Wrap-up: **Ulrich Kuhlmann** and **Harriet Hinz**